
Overview

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. ITS employs individuals, all of whom are Federal employees, with strong engineering and scientific skills and experience to support our technical programs. The majority of our employees are electronics engineers, with a complement of mathematicians, physicists, and computer scientists. ITS' support during Fiscal Year 2002 consisted of \$6.3 million of direct funding from the Department of Commerce and approximately \$3.9 million for work sponsored by other Federal agencies and U.S. industry.

History

ITS began in the 1940s as the Interservice Radio Propagation Laboratory, which after the war became the Central Radio Propagation Laboratory (CRPL) of the National Bureau of Standards, U.S. Department of Commerce. In 1965, CRPL joined the Environmental Science Services Administration (ESSA) and was renamed the Institute for Telecommunication Sciences and Aeronomy (ITSA). In 1967, ITSA split into two labs within ESSA, the Aeronomy Laboratory and the Institute for Telecommunication Sciences (ITS). In 1970, Executive Order 11556 established the Office of Telecommunications (OT) within the Department of Commerce and the Office of Telecommunications Policy (OTP) in the Executive Office; at the same time, ITS was transferred from ESSA to OT. Finally, under the President's Reorganization Act #1 of 1977, OT and OTP merged to form NTIA. Since that time, ITS has performed telecommunications research and provided technical engineering support to NTIA, and to other Federal agencies on a reimbursable basis. Over the last 15 years, ITS has pursued cooperative research with U.S. industry under the provisions of the Federal Technology Transfer Act of 1986.

Activities and Organization

ITS' technical activities are organized in four program areas:

- ***Spectrum and Propagation Measurements:*** ITS designs, develops, and operates state-of-the-art, automated spectrum measurement and

propagation measurement systems; measures spectrum occupancy trends and patterns; measures emission characteristics of Federal transmitter systems; identifies and resolves radio frequency interference involving Federal systems; and performs radio propagation measurements for model development.

- ***Telecommunications and Information Technology Planning:*** ITS plans and analyzes existing, new, and proposed telecommunications and information technology systems and services, in order to improve the efficiency and enhance the technical performance and reliability of those resources.
- ***Telecommunications Engineering, Analysis, and Modeling:*** ITS evaluates and enhances the technical performance characteristics of existing, new, and proposed individual telecommunication systems, to improve their efficiency and enhance their technical performance.
- ***Telecommunications Theory:*** ITS develops and enhances innovative telecommunication technologies and engineering tools through the use of electromagnetic theory, digital signal processing techniques, models of human perception, propagation modeling, and noise analysis.

The Institute's research and engineering work is supported by the ITS Director's Office, which promotes the Laboratory's mission nationally and internationally. The Director's Office also provides general guidance and support to the program, budget, and administrative functions of the Institute.

The Institute maintains a Program Development Office (PDO) to lead, coordinate, and integrate program development efforts for the Institute. The PDO works to identify new program areas that the Laboratory should explore, consistent with its research and engineering mission. The Institute also maintains an NTIA liaison function to provide advice and assistance to NTIA on preparation for and participation in national and international conferences and negotiations. In addition, the liaison coordinates technical research of the laboratory with other Federal agencies, e.g., the National Communications System.

Benefits

The Institute's research significantly benefits both the public and private sectors in several areas:

- **Spectrum Utilization:** Optimization of Federal spectrum allocation methods, identification of unused frequencies and potential interference through field measurements, and promotion of technology advances to aid in efficient use of the spectrum.
 - **Telecommunications Negotiations:** Expert technical leadership at international conferences and development of negotiation support tools such as interference prediction programs.
 - **International Trade:** Promulgation of nonrestrictive international telecommunications standards to remove technical barriers to U.S. export of telecommunications equipment and services.
 - **Domestic Competition:** Development of user-oriented, technology-independent methods of measuring telecommunications performance to give users a practical way of comparing competing equipment and services.
 - **National Defense:** Improvement of network operation and management, enhancement of survivability, expansion of network interconnections and interoperation, and improvement of emergency communications that contribute to the strength and cost-effectiveness of the U.S. Armed Forces.
 - **Technology Transfer:** Direct transfer of research results and measurements to U.S. industry and Government to support national and international competitiveness, bring new technology to users, and expand the capabilities of national and global telecommunications infrastructures.
- **Standards, Guidelines, and Procedures:** Contributions to and development of national and international standards in such areas as network interconnection and interoperation, performance evaluation, and information protection.
 - **Research Results:** Mathematical models for electromagnetic wave propagation, noise, and interference characterization.
 - **Expert Services:** Training courses and workshops to communicate technology advances and applications to industry and Government users.

Sponsors

Activities at the Institute are undertaken through a combination of programs sponsored by the Department of Commerce and other Federal agencies, and through cooperative research agreements with the private sector. The Institute's policy stipulates that research sponsored by other agencies must contribute to and reinforce NTIA's overall program and must be directed toward supporting the goals of the Department of Commerce. Agencies within the Department of Defense provide a significant portion of the Institute's other agency funding. Other major sponsors include the Department of Transportation, the Federal Aviation Administration, and the National Institute of Standards and Technology.

Cooperative research and development agreements (CRADAs) with telecommunication-operating companies and manufacturers support technology transfer and commercialization of telecommunications products and services, which are major goals of the Department of Commerce. ITS has CRADAs with large established companies as well as small, start-up companies. Partnerships such as these enhance synergies between entrepreneurial ventures and broad national goals.

Because of its centralized Federal role, ITS is able to provide a cost-effective, expert resource that supports many Federal agencies and industry organizations. ITS provides research and engineering that is critical to continued U.S. leadership in providing telecommunications and information equipment and services. This Progress Report summarizes technical contributions made by ITS during Fiscal Year 2002 to both the public and private sectors.

Outputs

Major outputs of the Institute's research and engineering activities include:

- **Engineering Tools and Analyses:** Predictions of transmission media conditions and equipment performance; test design and data analysis of computer programs; and laboratory and field tests of experimental and operational equipment, systems, and networks.